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Candidate Harmonized European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
ElectroMagnetic Compatibility (EMC)
standard for radio equipment and services;
Part 13: Specific conditions for Citizens' Band (CB) radio
and ancillary equipment (speech and non-speech)**



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Foreword

This Candidate Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [4] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility ("the EMC Directive") (89/336/EEC [3] as amended) and Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive" [2]).

The present document is part 13 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

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1 Scope

The present document, together with EN 301 489-1 [1], covers the assessment of Citizens' Band (CB) radio equipment, intended for the transmission of speech and/or data (non-speech), and associated ancillary equipment, in respect of ElectroMagnetic Compatibility (EMC).

Technical specifications related to the antenna port and emissions from the enclosure port of CB radio equipment are not included in the present document. Such technical specifications are found in the relevant product standards for the effective use of the radio spectrum.

The present document specifies the applicable EMC tests, the test methods, the limits and the performance criteria for CB radio equipment (speech and/or non-speech), and associated ancillary equipment.

Definitions of types of CB radio equipment covered by the present document are given in annex A.

In case of differences (for instance concerning special conditions, definitions, abbreviations) between the present document and EN 301 489-1 [1], the provisions of the present document take precedence.

The environmental classification and the emission and immunity requirements used in the present document are as stated in EN 301 489-1 [1], except for any special conditions included in the present document. The applicable environments referred to in EN 301 489-1 [1] where equipment covered by the scope of the present document may be used, shall be declared by the manufacturer.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] ETSI EN 301 489-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements".
- [2] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).
- [3] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).
- [4] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.
- [5] ETSI EN 300 135-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Angle-modulated Citizens Band radio equipment (CEPT PR 27 Radio Equipment); Part 1: Technical characteristics and methods of measurement".
- [6] ETSI EN 300 433-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Double Side Band (DSB) and/or Single Side Band (SSB) amplitude modulated citizen's band radio equipment; Part 1: Technical characteristics and methods of measurement".

3 Definitions, abbreviations and symbols

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 301 489-1 [1], clause 3, and the following apply:

integral antenna equipment: CB radio equipment without an accessible external transmission line interface

NOTE: Integral antenna CB equipment in the context of the present document should be understood to be low power hand-held CB radio equipment.

switching range: maximum frequency range over which the equipment can be operated without reprogramming or realignment

3.2 Abbreviations

For the purpose of the present document the following abbreviations apply:

| | |
|-----|-------------------------------|
| AM | Amplitude Modulation |
| BER | Bit Error Ratio |
| CB | Citizen's Band |
| DSB | Double Side Band |
| EMC | ElectroMagnetic Compatibility |
| EUT | Equipment Under Test |
| FM | Frequency Modulation |
| RF | Radio Frequency |
| SSB | Single Side Band |

3.3 Symbols

For the purposes of the present document, the following symbols apply:

| | |
|-------|--|
| emf | electromotive force |
| SINAD | Ratio of (Signal + Noise + Distortion) to (Noise + Distortion) |
| Tx | transmit mode of operation |

4 Test conditions

For the purposes of the present document, the test conditions of EN 301 489-1 [1], clause 4, shall apply as appropriate. Further product related test conditions for CB radio and ancillary equipment are specified in the present document.

4.1 General

For emission and immunity tests the test modulation, test arrangements, etc., as specified in the present document, clauses 4.1 to 4.5, shall apply.

For EMC tests, the CB radio equipment shall be operated on one channel frequency, which is close to the middle of the switching range declared by the manufacturer.

For EMC emission measurements of CB radio transmitters in Tx mode, the transmitter shall be operated to obtain its maximum peak envelope power. A single tone or bit stream shall be used to modulate the transmitter according to clause 4.5.

For immunity tests of CB radio transmitters, the transmitter shall be operated at its maximum RF output power, or at a level not less than 6 dB below that power level in the event of declared thermal limitations. The transmitter shall be modulated with normal test modulation (see clause 4.5).

For the immunity tests of CB radio receivers, the wanted input signal, coupled to the receiver, shall be modulated with normal test modulation (see clause 4.5).

4.2 Arrangements for test signals

The provisions of EN 301 489-1 [1], clause 4.2 shall apply.

4.2.1 Arrangements for test signals at the input of transmitters

The provisions of EN 301 489-1 [1], clause 4.2.1 shall apply.

4.2.2 Arrangements for test signals at the output of transmitters

The provisions of EN 301 489-1 [1], clause 4.2.2 shall apply.

4.2.3 Arrangements for test signals at the input of receivers

The provisions of EN 301 489-1 [1], clause 4.2.3 shall apply with the following modifications.

For integral antenna CB equipment, the wanted input signal, to establish a communication link, shall be approximately 40 dB above the minimum level necessary to achieve normal operation performance, as declared by the manufacturer.

For non-integral antenna CB equipment, the source of the wanted RF input signal shall be set to a nominal value of 40 dB μ V emf.

4.2.4 Arrangements for test signals at the output of receivers

The provisions of the EN 301 489-1 [1], clause 4.2.4 shall apply.

4.2.5 Arrangements for testing transmitter and receiver together (as a system)

The provisions of the EN 301 489-1 [1], clause 4.2.5 shall apply.

4.3 Exclusion bands

The provisions of the EN 301 489-1 [1], clause 4.3 shall apply.

4.3.1 Receiver and receivers of transceivers exclusion band

The exclusion band for receivers and receivers of transceivers is the frequency range determined by the switching range, as declared by the manufacturer, extended as follows:

- the lower frequency of the exclusion band is the lower frequency of the switching range, minus 5 % of the centre frequency of the switching range;
- the upper frequency of the exclusion band is the upper frequency of the switching range, plus 5 % of the centre frequency of the switching range.

4.3.2 Transmitter exclusion band

The exclusion band for transmitters extends ± 25 kHz from the nominal operating frequency of the transmitter.

4.4 Narrow band responses of receivers

The provision of EN 301 489-1 [1], clause 4.4 shall apply.

4.5 Normal test modulation

4.5.1 Angle-modulated CB radio equipment

Analogue speech applications:

- the receiver wanted RF input signal shall be set to the nominal frequency of the receiver and modulated with a sinusoidal audio frequency of 1 000 Hz. The wanted test signal shall have an FM deviation of at least 1,2 kHz;
- the transmitter shall be modulated with a sinusoidal audio frequency signal of 1 000 Hz. The level of this audio signal shall be adjusted to obtain at least 1,2 kHz FM peak deviation.

Non-speech applications:

- the receiver wanted RF input signal shall be set to the nominal frequency of the receiver and modulated with a test signal specified by the manufacturer which represents normal operation;
- the transmitter shall be modulated with a test signal which represents normal operation as specified by the manufacturer;
- the modulation signal generator shall be able to produce a continuous stream of data or a repetitive message;
- the receiver (that means the EUT or the measurement equipment used) (demodulator) shall be able to measure the Bit Error Ratio (BER) of a continuous data stream or a repetitive readout of message acceptance.

4.5.2 DSB or SSB modulated CB radio equipment

Analogue speech applications:

- the receiver wanted RF input signal shall be set to the nominal frequency of the receiver and modulated with a sinusoidal audio frequency of 1 000 Hz. In case of DSB (AM) a modulation depth of at least 60 % shall be used for the wanted test signal. For SSB receivers the wanted signal shall be in the receiver passband at a frequency giving a 1 kHz audio output;
- in case of DSB (AM), the transmitter of the EUT shall be modulated with a sinusoidal audio frequency signal of 1 000 Hz. The level of this audio signal shall be set to obtain at least 60 % AM modulation depth of the RF output signal;
- in case of SSB, the transmitter of the EUT shall be modulated with a sinusoidal audio frequency signal of 1 000 Hz, the level shall be set to obtain 60 % of the maximum peak envelope RF output power. The level of this audio signal shall be increased by 3 dB and this signal shall be used as normal test modulation signal.

Non-speech applications:

- the receiver wanted input signal shall be set to the nominal frequency of the receiver modulated with a test signal specified by the manufacturer which represents normal operation;
- the transmitter shall be modulated with a test signal which represents normal operation as specified by the manufacturer;
- the test signal generator (modulation) shall be able to produce a continuous stream of data or a repetitive message;
- the test signal receiver (demodulator) shall be able to produce a readout of Bit Error Ratio (BER) of a continuous data stream or a repetitive readout of message acceptance.

5 Performance assessment

5.1 General

The provision of EN 301 489-1 [1], clause 5.1 shall apply with the following modification.

In addition, the manufacturer shall at the time of submission of the equipment for test, supply the following information to be recorded in the test report:

- the applicable equipment category (category 1 or category 2) according to clauses 6 and 6.1;
- the secondary user functions of the CB radio equipment and the related performance criteria; and
- the AC/DC power converter intended to be used with the EUT (if any).

5.2 Equipment which can provide a continuous communications link

The provision of EN 301 489-1 [1], clause 5.2 shall apply.

5.3 Equipment which does not provide a continuous communications link

The provision of EN 301 489-1 [1], clause 5.3 shall apply.

5.4 Ancillary equipment

The provision of EN 301 489-1 [1], clause 5.4 shall apply.

5.5 Equipment classification

The provision of EN 301 489-1 [1], clause 5.5 shall apply.

6 Performance criteria

The product family of CB radio and associated ancillary equipment is divided into two categories of equipment, each having its own set of performance criteria.

One category comprises all types of CB equipment except integral antenna CB equipment; such equipment shall meet the performance criteria in table 1 including the associated notes 1 and 2.

The other category comprises integral antenna CB equipment used for portable applications and shall meet the performance criteria in table 2 including the associated note.

Portable CB equipment intended for use whilst powered by the main battery of a vehicle shall additionally fulfil the applicable requirements set out in EN 301 489-1 [1], clauses 7.1 and 7.2 for mobile equipment.

Portable or mobile CB equipment intended for use whilst powered by the AC mains shall additionally fulfil the applicable requirements of EN 301 489-1 [1], clauses 7.1 and 7.2 for base station equipment.

The establishment of the communication link at the start of the test, its maintenance and the assessment of the recovered signal are used as the performance criteria for the evaluation of the essential functions of the equipment during and after the test.

The performance criteria A, B and C set out in table 1 shall be used in the following manner:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature and **short voltage dips**;
- performance criteria C for immunity tests with power interruptions and voltage dips exceeding a certain period of time (**long voltage dips**).

CB radio equipment may contain user functions which are of primary relevance from the point of view of conveying information or configure the equipment to allow the exchange of information.

In addition other user functions may be included in the equipment which do not have a functional relationship with the primary function.

From the perspective of developing intrinsic immunity specifications (minimum performance criteria) the example below illustrates what is considered as primary and what as secondary user functions.

EXAMPLE: A CB radio receiver also containing an alarm clock:

- primary user functions are the reception of CB radio transmissions, or decoding of selective calls, if provided;
- secondary user functions are all functions related to the alarm clock.

6.1 Performance criteria for primary user functions

Dependent from the category of the EUT, it shall meet the performance criteria specified in table 1 or 2, as detailed in the special performance criteria in clause 6.1.1, or 6.1.2, or 6.1.3, as appropriate.

Table 1: Performance criteria for non integral antenna CB equipment (primary user functions)

| During test | After test | Criteria |
|---|--|----------|
| Operate as intended; Degradation of performance (see note 1); No loss of primary user functions or stored data; No unintended RF transmission. | Operate as intended; No degradation of performance (see note 2); No loss of function; No loss of stored data. | A |
| Loss of function (one or more); No unintended RF-transmission; No loss of primary user functions or stored data. | Operate as intended; No degradation of performance (see note 2); Lost functions self-recoverable. | B |
| Loss of function (one or more) and/or user data; No unintended RF-transmission. | Operate as intended; No degradation of performance (see note 2); Lost functions recoverable by the operator, either automatically or by operation of user control (as declared by the manufacturer). | C |
| <p>NOTE 1: For non-integral antenna CB radio equipment the degradation of performance during the test is specified by the permissible degradation of performance (see also clause 6.1.2). If the permissible degradation of performance is not specified by the manufacturer, then this may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> <p>NOTE 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible degradation of performance is not specified by the manufacturer, then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> | | |

Table 2: Performance criteria for integral antenna CB equipment (primary user functions)

| During test | After test | Criteria |
|--|--|----------|
| Loss of function (one or more); No unintended RF transmission; No unintended function. | Operate as intended; Lost functions self-recoverable; No degradation of performance (see note). | A, B |
| Loss of function (one or more); No unintended RF-transmission; No unintended function. | Operate as intended; No degradation of performance (see note); Lost functions recoverable by the operator, either automatically or by operation of user control (as declared by the manufacturer). | C |
| NOTE: For integral antenna CB equipment no degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended. | | |

6.1.1 Performance criteria A for continuous phenomena applied to CB radio equipment (primary user functions)

The performance criteria for continuous phenomena detail the performance criteria in table 1 and 2 (performance criteria A) as follows:

Non integral antenna CB equipment:

during the EMC exposure:

- for speech equipment (non-integral antenna CB equipment), the SINAD ratio of the audio signal measured during each individual exposure in the test sequence shall not be lower than 12 dB. The frequency response of the SINAD measurement equipment shall be flat within ± 3 dB in the frequency range 100 Hz to 10 kHz;
- for non-speech equipment (non-integral antenna CB equipment), four messages out of five or 80 % of the transmitted symbols shall be correctly received.

after the EMC exposure:

- the EUT shall operate as intended with no loss of primary and secondary user functions or stored data, and the communication link shall have been maintained during the test.

Integral antenna CB equipment:

during the EMC exposure:

- the loss of function of the EUT (see table 2) is specified as a loss of the communication link during the EMC exposure.

after the EMC exposure:

- the provisions of table 2 apply.

Where the EUT is a transmitter only, tests shall be repeated with the EUT in keyed down and/or stand-by mode to ensure that unintentional transmission does not occur.

6.1.2 Performance criteria B for transient phenomena and short voltage dips applied to CB radio equipment (primary user functions)

Performance criteria B shall apply to transient phenomena and **short voltage dips** corresponding to a **reduction of the supply voltage of 30 % for 10 ms**.

The special performance criteria for transient phenomena detail the performance criteria in table 1 and 2 (performance criteria B) as follows:

Non integral antenna CB equipment:

after the EMC exposure:

- at the conclusion of each EMC exposure the CB equipment shall operate with no user noticeable loss of the communication link;
- at the conclusion of the total test comprising the series of individual exposures the EUT shall operate as intended with no loss of primary and secondary user functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained.

Integral antenna CB equipment:

after the EMC exposure:

- the communication link may have been lost during the test. Primary and secondary user functions, which have been lost during the test, shall be recoverable by operating the user control or reset functions.

6.1.3 Performance criteria C for long voltage dips and interruptions applied to CB radio equipment (primary user functions)

Performance criteria C shall apply to **voltage interruptions** and **long voltage dips** corresponding to a **reduction of the supply voltage of 60 % for 100 ms**.

The special performance criteria for voltage interruptions and dips exceeding a certain period of time detail the performance criteria in table 1 and 2 (performance criteria C) as follows:

All categories of CB equipment:

during the EMC exposure:

- the communications link may be lost and one or more functions and/or stored user data may be lost;
- during and after the test there shall be no unintended transmission.

after the EMC exposure:

- the communications link shall be recoverable either automatically or by operational user control as declared by the manufacturer;
- the speech quality level shall return to a level not below that specified by the manufacturer and the digital throughput shall return to its nominal value.

6.2 Performance criteria for secondary user functions

For secondary user functions, the EUT shall meet the performance criteria as specified by the manufacturer (see clause 5.1).

6.3 Performance criteria for equipment which does not provide a continuous communication link

The provision of EN 301 489-1 [1], clause 6.3 shall apply.

6.4 Performance criteria for ancillary equipment tested on a stand alone basis

The provision of EN 301 489-1 [1], clause 6.4 shall apply.

7 Applicability overview

7.1 Emission

7.1.1 General

EN 301 489-1 [1], table 2, contains the applicability of EMC emission measurements to the relevant ports of radio and/or associated ancillary equipment.

7.1.2 Special conditions

The following special conditions set out in table 3, relate to the emission test methods used in EN 301 489-1 [1], clause 8.

Table 3: Special conditions for EMC emission measurements

| Reference to clauses in EN 301 489-1 [1] | Special product-related conditions, additional to or modifying the test conditions in EN 301 489-1 [1], clause 8 |
|---|--|
| 8.3.2 Test method; DC power input/output ports | In Tx mode of operation, for transmitters operating at a frequency below 30 MHz, the transmitter exclusion band shall be taken into account. |
| 8.4.2 Test method; AC mains power input/output ports | In Tx mode of operation, for transmitters operating at a frequency below 30 MHz, the transmitter exclusion band shall be taken into account. |

7.2 Immunity

7.2.1 General

EN 301 489-1 [1], table 3, contains the applicability of EMC immunity measurements to the relevant ports of radio and/or associated ancillary equipment.

7.2.2 Special conditions

The following special conditions set out in table 4, relate to the immunity test methods and performance criteria used in EN 301 489-1 [1], clause 9.

Table 4: Special conditions for EMC immunity tests

| Reference to clauses in EN 301 489-1 [1] | Special product-related conditions, additional to or modifying the test conditions in EN 301 489-1 [1], clause 9 |
|---|---|
| 9.1 Test configuration; Test methods and levels for immunity tests | For immunity tests of transmitters, the transmitter shall be operated at its maximum RF output power, or at a level not less than 6 dB below that power level in the event of declared thermal limitations. The immunity tests shall be performed with the EUT successively set to all modes of operation available for the EUT. |
| 9.4.2 Test method; Fast transients, common mode | Internal DC input ports: This test does not apply to internal battery compartment DC input ports which do not serve the purpose of connection to any remote AC/DC power adapter. |
| 9.5.2 Test method; Radio frequency, common mode | Internal DC input ports: This test does not apply to internal battery compartment DC input ports which do not serve the purpose of connection to any remote AC/DC power adapter. |
| 9.7.3 Performance criteria; Voltage dips and interruptions | Different special performance criteria apply for the different types of voltage dips and interruptions, for details see clauses 6.1.2 and 6.1.3 of the present document. |

Annex A (normative): Definitions of types of CB radio equipment within the scope of the present document

The present document covers types of CB radio equipment as set out in the following clauses.

A.1 Angle-modulated Citizens' Band (CB) radio and ancillary equipment, (speech and/or non-speech equipment)

The present document applies to angle-modulated Citizen's Band (CB) radio equipment and associated ancillary equipment operating in the frequency range 26 MHz to 28 MHz.

Angle-modulated CB radio equipment covered by the scope of the present document is defined in EN 300 135-1 [5].

A.2 Double Side Band (DSB) and/or Single Side Band (SSB) Citizens' Band (CB) radio and ancillary equipment, (speech and/or non-speech equipment)

The present document applies to Double Side Band (DSB) and/or Single Side Band (SSB) modulated Citizen's Band (CB) radio equipment and associated ancillary equipment operating in the frequency range 26 MHz to 28 MHz.

Double Side Band (DSB) and/or Single Side Band (SSB) modulated CB radio equipment covered by the scope of the present document is defined in EN 300 433-1 [6].

History

| Document history | | |
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